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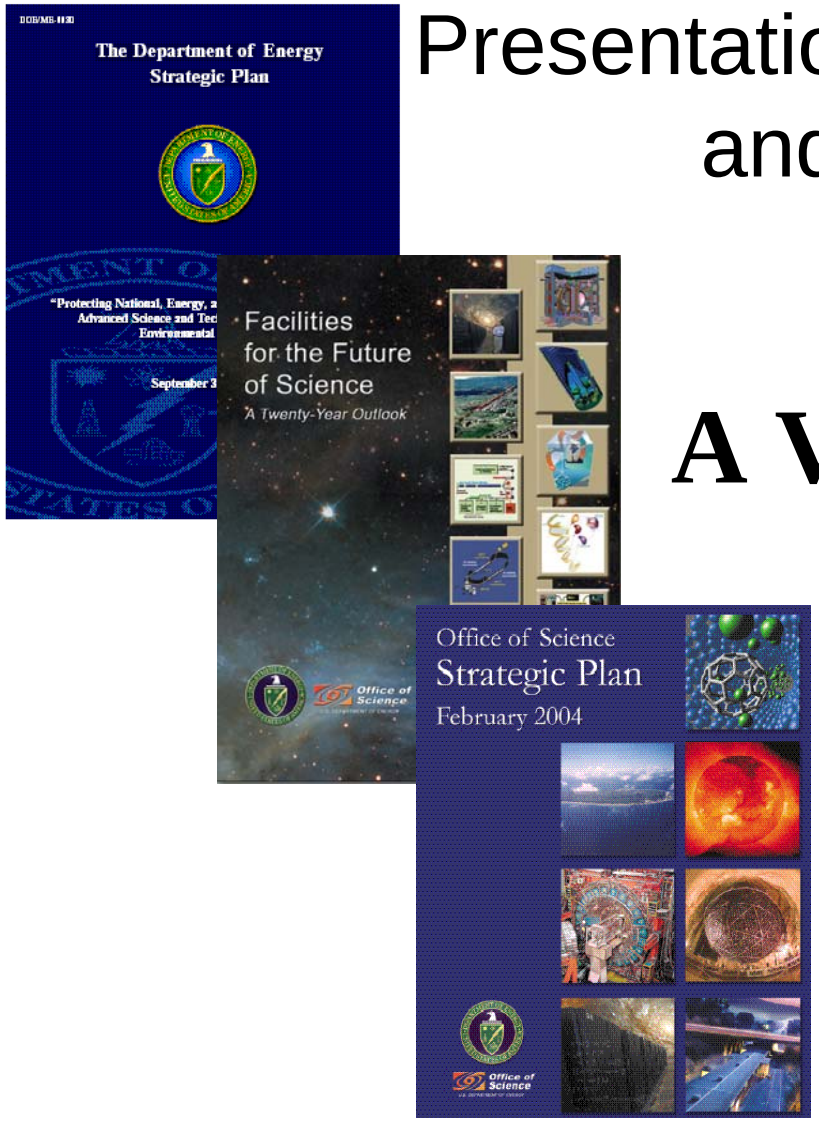

Presentation to the San Diego Science and Technology Council

A Vision for the Future of Science

Raymond L. Orbach
Director
Office of Science
U.S. Department of Energy
October 7, 2004

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The Department of Energy is a Science Agency

Top Five Government Research Organizations for:

Physical Sciences	Mathematics & Computing	Life Sciences	Environmental Sciences
1. Energy (1,428)	1. Energy (147)	1. HHS (10,504)	1. NASA (534)
2. NASA (715)	2. DOD (205)	2. USDA (791)	2. NSF (523)
3. NSF (556)	3. NSF (555)	3. DOD (576)	3. Energy (227)
4. DOD (224)	4. NASA (19)	4. NSF (447)	4. DOD (162)
5. HHS (263)	5. HHS (17)	5. Energy (206)	5. HHS (139)

Numbers are FY 2003 dollars in millions - Source: NSF -- Preliminary Federal obligations for research, by agency and field of science and engineering: fiscal year 2003: Basic Research by Agency and Field of Science and Engineering

The Office of Science

- **The Office of Science is the primary source of Federal support for the Physical Sciences (40%).**
  - Provides 90% of support for High Energy & Nuclear Physics, 60% of Catalysis, 25% of Nanoscience
  - Provides sole support to select sub-fields (e.g. Nuclear Medicine, Heavy Element Chemistry, Magnetic Fusion)
  - Manages long term, high risk, multidisciplinary science programs to support DOE missions.
  - Directly supports the research of 15,000 PhDs, PostDocs and Graduate Students.
- **Constructs and operates large scientific facilities for the U.S. scientific community.**
  - Accelerators, light & neutron sources, nanotechnology centers.
    - *Used by more than 19,000 researchers every year.*
  - Infrastructure support for ten Science laboratories.

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Science Presence - *10 National Labs, Research at 280 Universities and 42 Major Scientific User Facilities*

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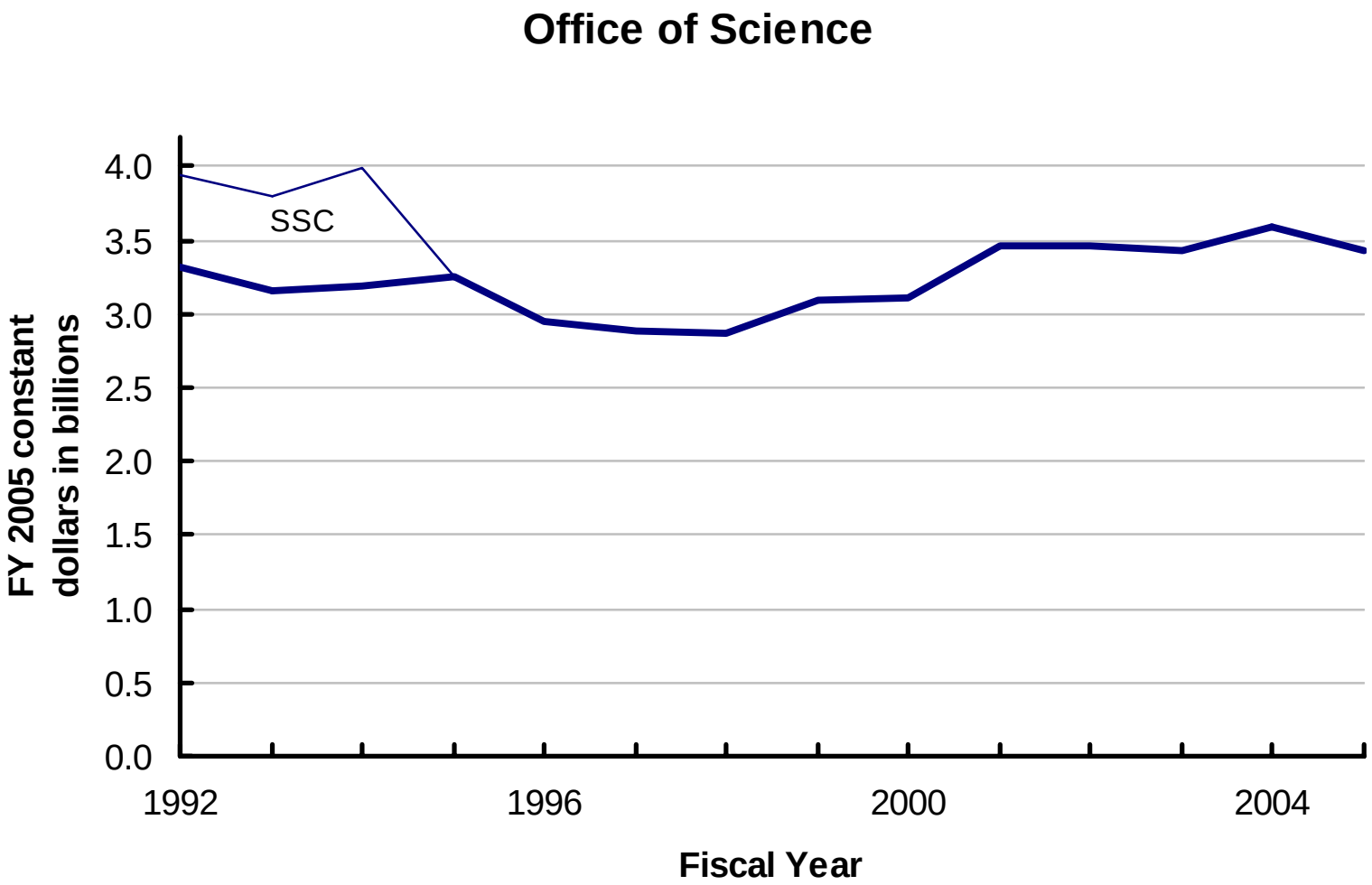
Funding History, FY1992–2005

Appropriations in FY 2005 constant dollars

(FY 2005 amount is the requested level.)



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Office of Science Strategic Plan 20 –Year Goals

- ***ITER for Fusion Energy:*** Provide the enduring solution to our Nation's energy challenge, conducting the burning plasma experiment that will bring fusion energy within reach as a commercial source of clean, abundant energy.
- ***Scientific Discovery through Advanced Scientific Computing:*** Expand the broad frontiers of scientific discovery through the power of advanced computation.
- ***Nanoscale Science for New Materials and Processes:*** Master the ability to construct revolutionary new materials and processes…atom-by-atom and build upon Nature's self-assembling techniques.
- ***Taming the Microbial World—the Next Revolution in Genomics:*** Harness microbial genomes and the molecular machines of life for energy, the environment, and human health.
- ***Dark Energy and the Search for the Genesis:*** Illuminate the basic forces of creation and the origins of matter, energy, space, and time.
- ***Nuclear Matter at the Extremes:*** Explore new forms of nuclear matter at high-energy densities and at the extreme limits of stability.
- ***Facilities for the Future of Science:*** Deliver the high-priority facilities over the next 20 years that support DOE's and the Nation's research.

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Office of Science 20-Year Facilities Outlook

Throughout its history, the DOE's Office of Science has designed, constructed, and operated many of the Nation's most advanced, large-scale R&D user facilities.

-- Spencer Abraham, Secretary of Energy

- SC facilities used by more than 19,000 users world-wide.
- A list of 28 world-class facilities and upgrades that will ensure U.S. scientific pre-eminence for the next two decades.
- Sets priorities across disciplines and fields of research.
- Complements interests of other U.S. science agencies (e.g., NASA, NSF, NIH.)
- Within Congressional Authorization levels

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Office of Science 20-Year Facilities Outlook

Priority Near-Term

Priority		
1	FES	International Thermonuclear Experimental Reactor
2	ASCR	UltraScale Scientific Computing Capability
Tie for 3	HEP	Joint Dark Energy Mission
	BES	Linac Coherent Light Source
	BER	Protein Production and Tags
	NP	Rare Isotope Accelerator
Tie for 7	BER	Characterization & Imaging
	NP	Continuous Electron Beam Accelerator Facility 12GeV Upgrade
	ASCR	Esnet Upgrade
	ASCR	NERSC Upgrade
	BES	Transmission Electron Achromatic Microscope
12	HEP	BTeV

Priority Mid-Term

Priority		
13	HEP	Linear Collider
Tie for 14	BER	Cellular Systems Analysis & Modeling
	BES	SNS 2-4 MW Upgrade
	BES	SNS Target Station II
	BER	Whole Proteome Analysis
Tie for 18	NP	Double Beta Decay Underground Detector
	FES	Next Step Spherical Tokamak
	NP	RHIC II

Far-Term

Tie for 21	BES	National Synchrotron Light Source Upgrade
	HEP	Super Neutrino Beam
Tie for 23	BES	Advanced Light Source Upgrade
	BES	Advanced Photon Source Upgrade
	NP	eRHIC
	FES	Fusion Energy Contingency
	BES	High Flux Isotope Reactor Guide Hall II
	FES	Integrated Beam Experiment

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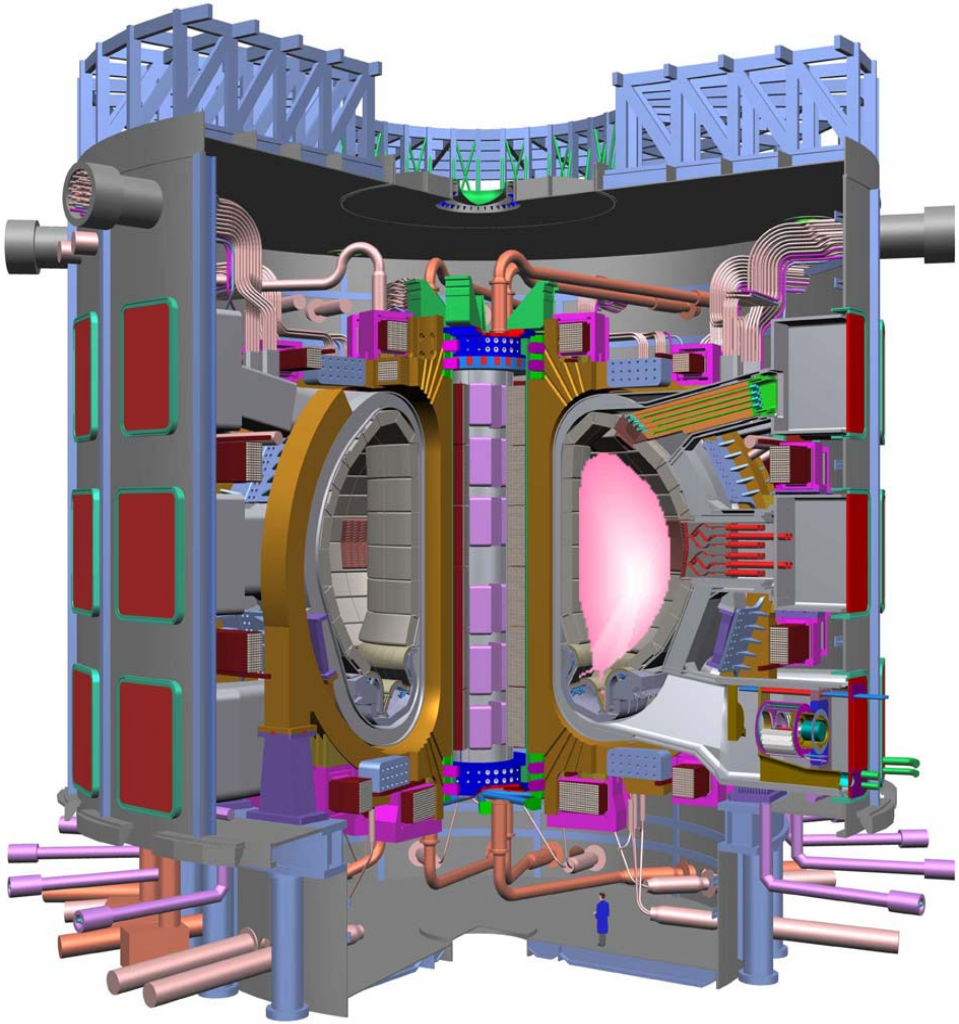
ITER



ITER is an international collaboration to build the first fusion science experiment capable of producing a self-sustaining fusion reaction, called a burning plasma. It is the next essential and critical step on the path toward demonstrating the scientific and technological feasibility of fusion energy

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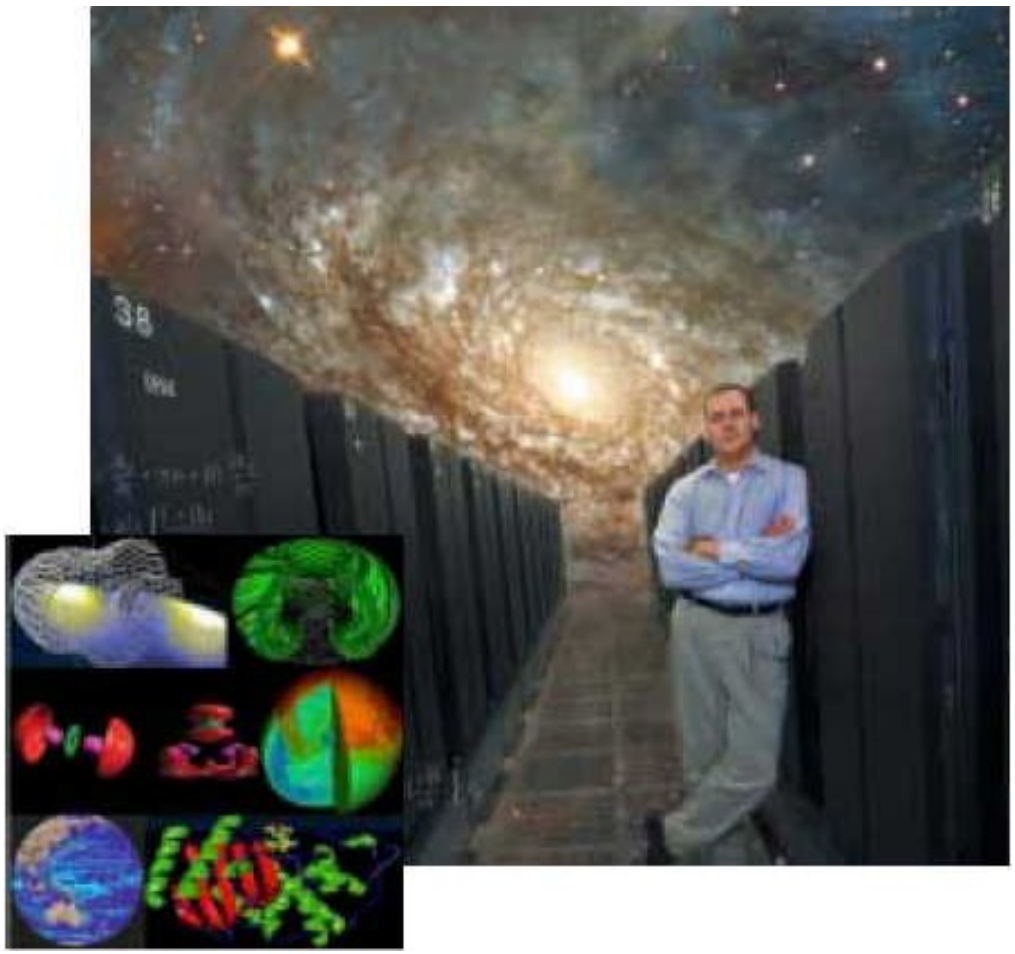
Ultrascale Scientific Computing Capability (USSCC)



The USSCC will increase by a factor of 100 the computing capability to support civilian scientific research –reducing from years to days the time required to simulate complex systems, such as the chemistry of a combustion engine or weather and climate – and providing much finer resolution

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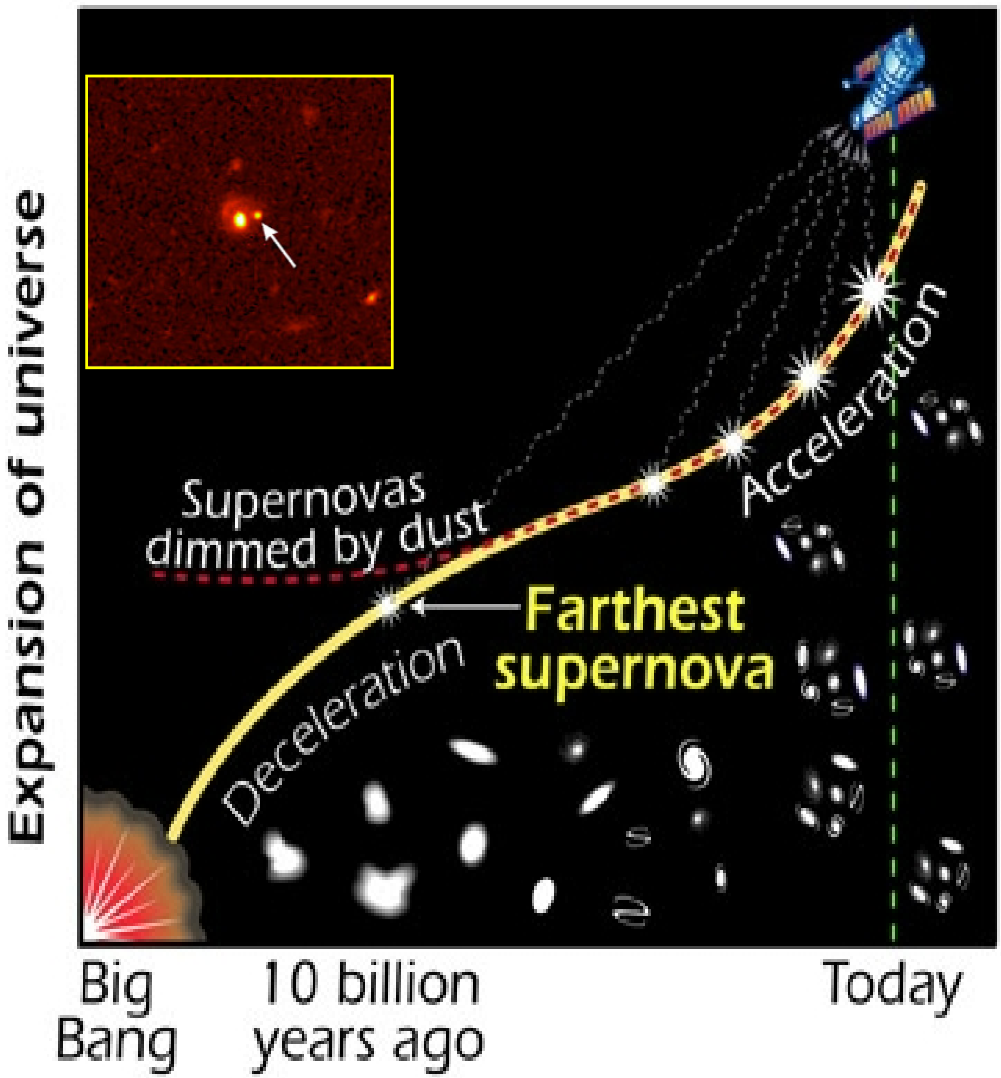
Joint Dark Energy Mission (JDEM)



JDEM is a space-based probe, developed in partnership with NASA, designed to help understand the recently discovered "Dark Energy" which makes up more than 70% of the universe, and evidently causes its accelerating expansion

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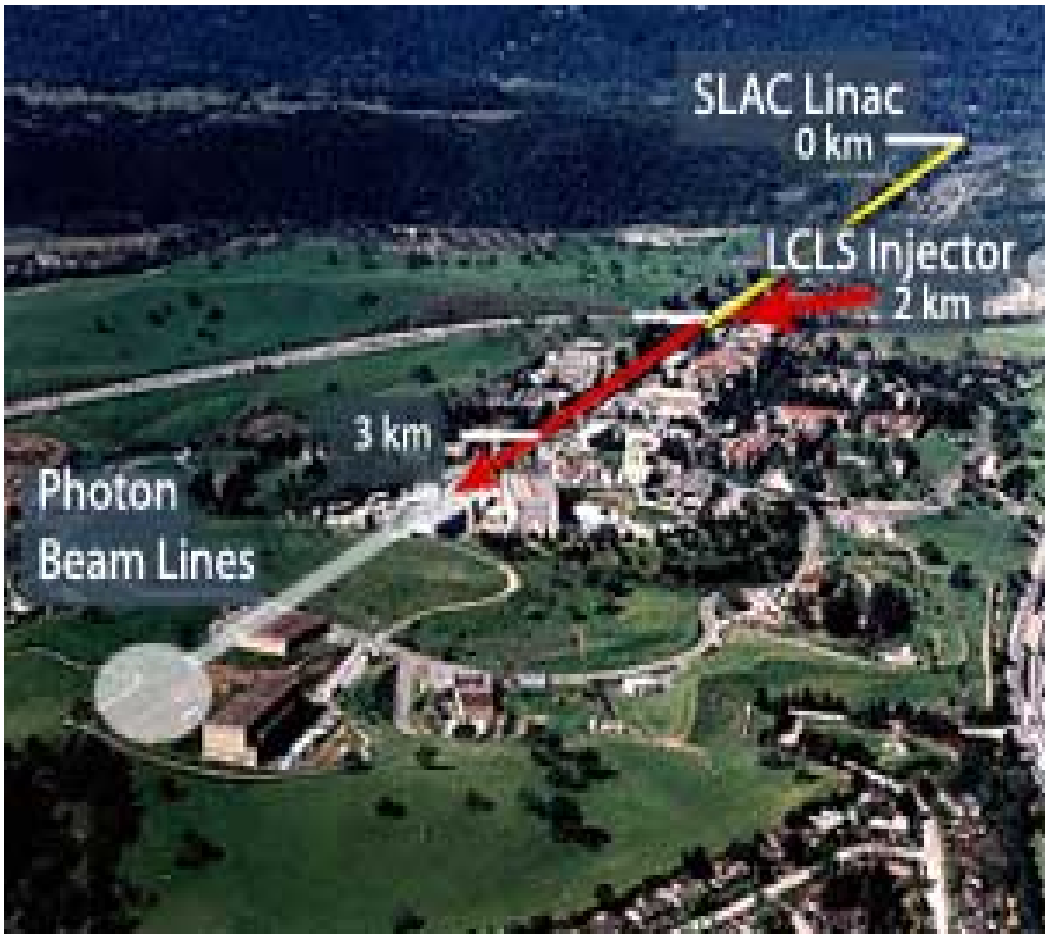
Linac Coherent Light Source (LCLS)



The LCLS will provide laser-like radiation 10 billion times greater in power and brightness than any existing x-ray light source, enabling the study of matter and chemical reactions at speeds and levels of detail well beyond what is currently possible, allowing us to “see” chemical bonds form and break atom-by-atom

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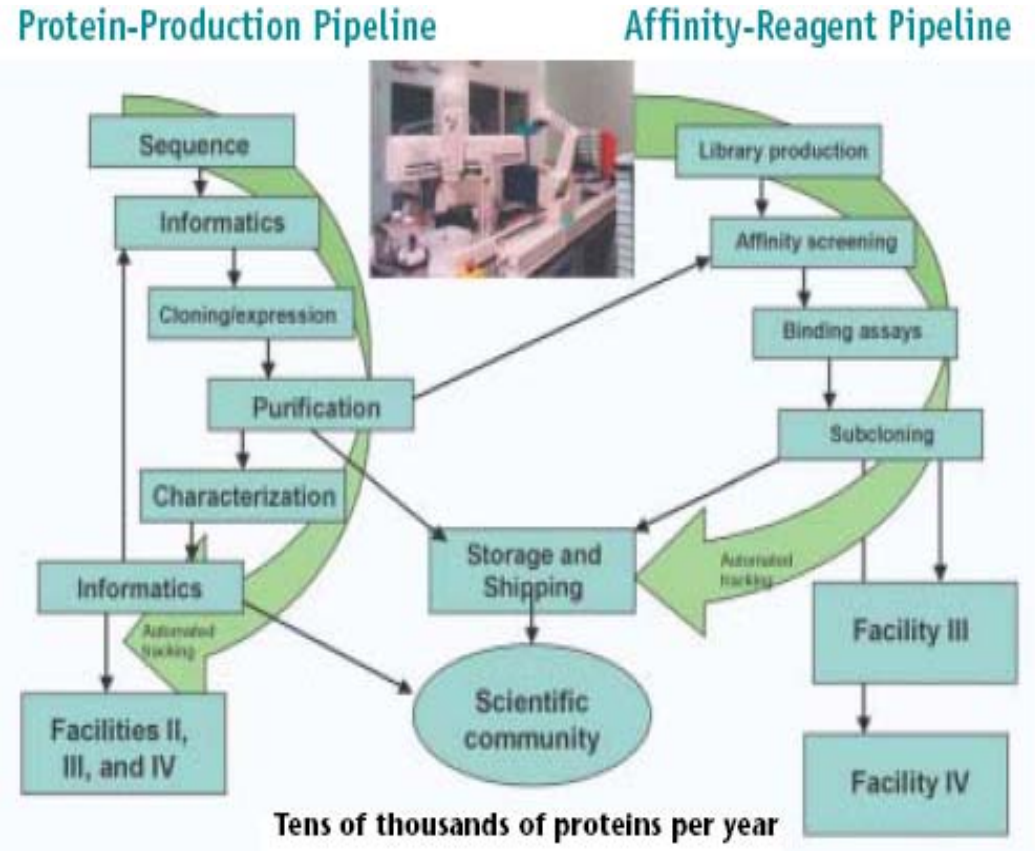
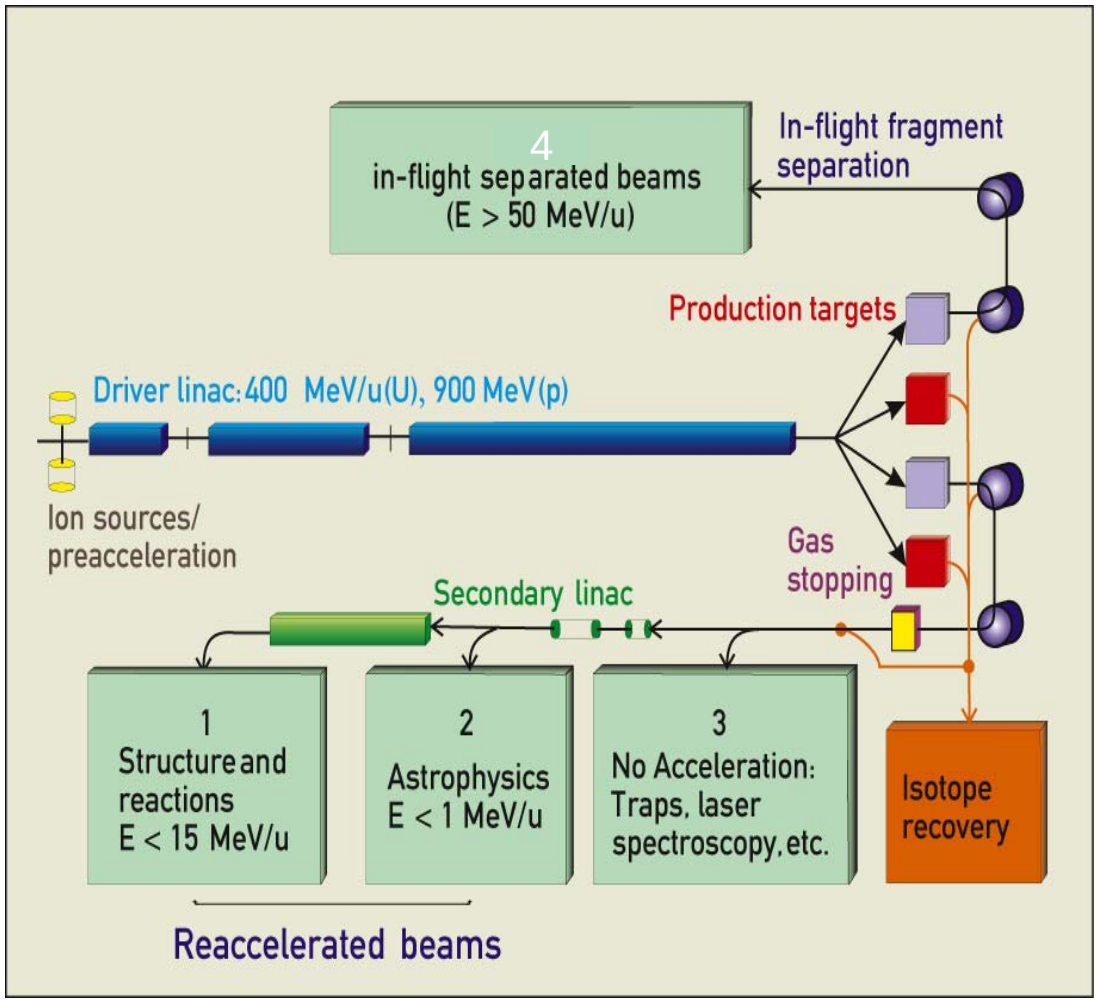
Protein Production and Tags



The Protein Production and Tags facility will use highly automated processes to mass-produce and characterize tens of thousands of proteins per year, create “tags” to identify these proteins, and make these products available to researchers nationwide

Rare Isotope Accelerator (RIA)



RIA will be the world's most powerful research facility dedicated to producing and exploring new rare isotopes not found naturally on earth. Living for only thousandths of a second, they are central to understanding the origin of the chemical elements and the processes that fuel the stars.

"These twin capabilities of powerful computing and powerful instrumentation open up entirely new areas of science at what I call the frontier of complexity. The opportunities have expanded suddenly in materials science, life science, and all the applied sciences. But they have also expanded at the traditional frontiers of the very large and the very small"

Dr. John Marburger
Director, Office of Science and Technology Policy